

# BLUETOOTH PHOTOCELLS

**CRONOPIC FB-3**



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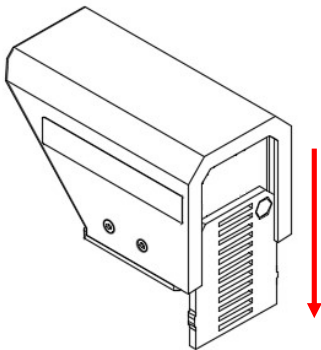
v2.0

Our CRONOPIC photocells consist of two devices: an emitter and a receiver. When aligned, they create an invisible infrared barrier that emits a Bluetooth signal each time it's interrupted by a sufficiently large object. The precision, power, and user-friendly nature of these photocells are the result of over 10 years of experience, testing, correction, and improvements. The new FB-3 model is smaller, more powerful, more immune to sunlight and small objects, more shock-resistant, and easier to align. As if that's not enough, they now operate on four batteries instead of six and have twice the autonomy.

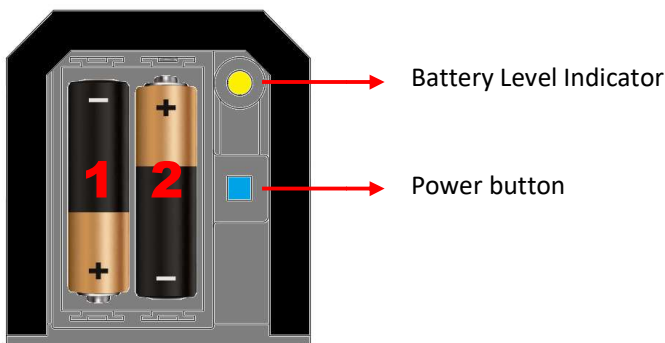
These photocells were designed and built with extreme outdoor use in mind. They withstand rain, dust, snow, and the relentless punishment of the sun. The materials used were chosen to provide reasonable resistance to impacts and the sun's UV rays. That's why we strategically use materials like ASA, Nylon, Pet, and acrylic. Unlike a mass-market product, this equipment is aimed at professionals who appreciate attributes such as durability, reliability, ease of maintenance, constant availability of spare parts for discontinued versions, a long warranty, and quick, personalized support. Our premise is for you to make the investment only once and not pay for our mistakes. It is not our intention to profit from planned obsolescence, expensive spare parts, or bureaucracy in support or warranty. We hope you enjoy our product as much as we enjoyed making it.

## QUICK GUIDE

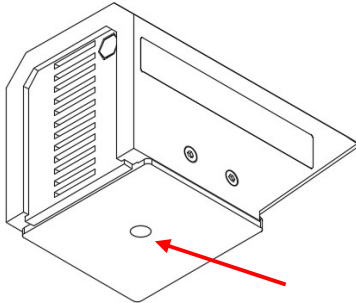
1. The emitter is the shorter device (it sends an infrared signal to the receiver).
2. The receiver is the longer device (it receives the infrared signal and sends the time cut via Bluetooth).
3. Remove the cover and insert two AA batteries (alkaline or rechargeable) into each one:



4. Turn on each one using the small button to the right of the batteries. A flashing yellow light should blink on both:



5. When removing the batteries, due to the narrow space, you'll find it easier if you first remove battery number 1 and then number 2.
6. Additionally, when you turn on the receiver, you'll hear an annoying BEEP sound. When the receiver is aligned with the emitter (both turned on), the sound will turn off (indicating that both are aligned).
7. Mount the photocells on standard photography tripods or any 1/4" threaded mount:



8. Now, when something crosses the invisible barrier, you'll hear a short BEEP sound, and the receiver will transmit a Bluetooth signal to your phone or computer. Test it by interrupting the barrier with your hand.
9. If you're testing the photocells inside your home, increase the separation between the emitter and the receiver to at least 1 meter (about 3 feet) to better simulate their use. Due to the high power of the signal and the infrared beam bouncing off walls and objects around, the sensor may not trigger unless interrupted by thick objects like your hand or arm.
10. To use them with your phone or tablet, enable the Bluetooth function on the device and follow the steps from the corresponding guide.
11. To use them with a computer, you'll need the separately acquired BLUETOOTH USB INTERFACE, and its usage is explained later in this guide.

## BATTERY LEVEL INDICATOR

The light on each photocell indicates the battery level. The following light code will allow you to determine the battery level in two scenarios:

- a. Alkaline batteries (shows two levels)
- b. Ni-MH rechargeable batteries (shows three levels)

a.



Very slow blink (once every four seconds) -> High level

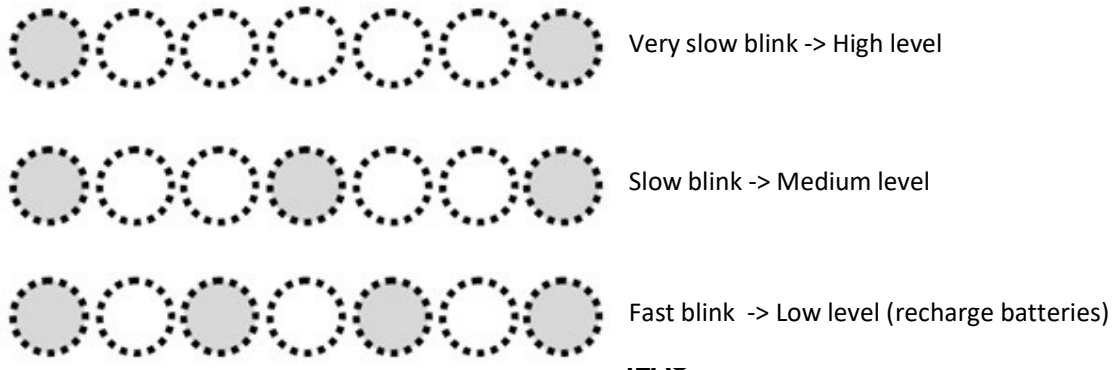


Slow blink (once per second) -> Low level (replace batteries)



Fast blink (three times per second) -> Dead batteries

b.



## BATTERIES

The batteries last for over 70 hours for the emitter and over 180 hours for the receiver. This is when using good-quality alkaline or 2000 mAh Ni-MH rechargeable batteries (duration may decrease below -5°C). The operating voltage ranges from 2.2V to 4V. Avoid purchasing cheap rechargeable batteries as they might be counterfeit. We recommend SONY CYCLE ENERGY, PANASONIC ENELoop, and RAYOVAC batteries. Pay attention to the capacity; a 2000 mAh battery will last twice as long as a 1000 mAh one. However, do not trust batteries with a capacity exceeding 3000 mAh, as they could be counterfeit. Rechargeable batteries will have a longer lifespan if used at least once a month and stored at 60% to 80% capacity, meaning neither fully charged nor fully discharged (otherwise, we recommend using alkaline batteries). For Ni-MH rechargeable batteries, it is neither necessary nor recommended to fully discharge them before charging.

## CHARGERS

If you use rechargeable batteries, you will need a suitable charger. There are three types of chargers:

a. Slow chargers

b. Fast chargers

c. Smart chargers

- a. Slow chargers: They charge the batteries for about 10 hours and then stop, regardless of whether the battery was previously charged or not. Perform a full charge only if the battery level indicated by the photocell is low; otherwise, perform a partial charge (e.g., 5 hours). If you perform many full charges without the batteries being at a low level, you may reduce the lifespan of the batteries.

- b. Fast chargers (less than 5 hours): We do not recommend these chargers because it is even easier to overcharge the batteries compared to slow chargers if you do not pay attention to the previous battery charge.
- c. Smart chargers: They charge only what the battery needs, quickly and individually, so they cannot overcharge them. We recommend them if you have many photocells and need to charge them quickly and safely. We recommend the "Intellicharger" line from NITECORE.

## **ACCURACY**

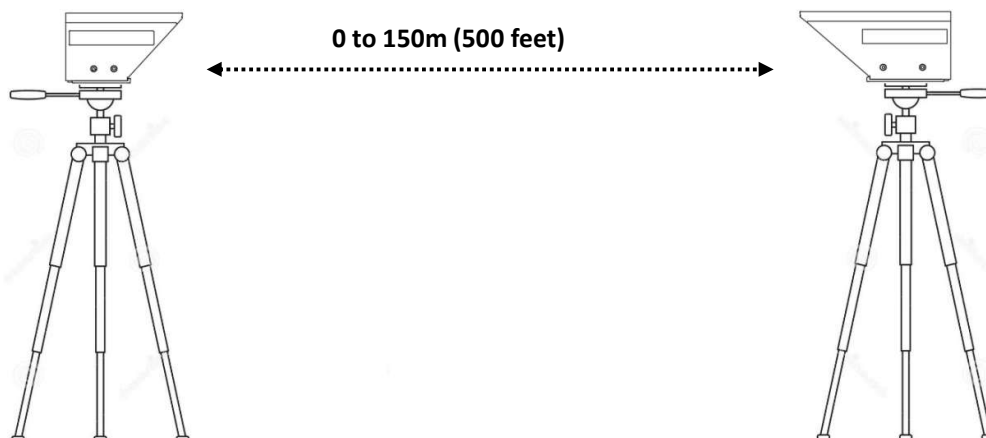
The accuracy of the photocell is 1 ms (0.001s). The detection width is greater than 15mm (between 9/16 to 5/8 inches) when the photocell is well aligned. The photocell will detect any object thick enough (more than 15mm) that crosses the barrier and takes more than 1 ms to cross. This means, for example, it can detect a motorcycle crossing at a maximum speed of 300 km/h.

## **DEAD TIME**

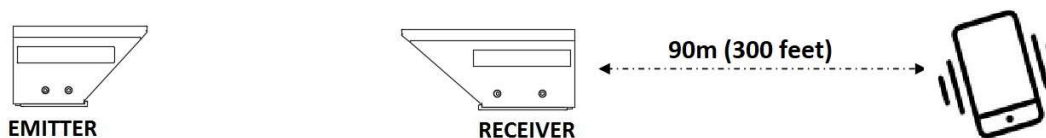
Dead time is the minimum time that must elapse between two shots. Do not confuse it with accuracy. The minimum dead time is 0.05 seconds. If you need a longer time, you can choose it from the app. For example, in a ski competition, you might need a dead time at the start of between 1 and 2 seconds to give the racer enough time to cross their entire body; otherwise, three shots could occur (the first when the left arm crosses, the second when the body crosses, and the third when the right arm crosses). However, at the finish line, the racers cross faster and closer together, so you might need a time of about 0.5s or less. The lower the dead time you choose, the more racers crossing closely you can detect, but more false shots may occur if a racer crosses slowly. Don't worry; it's not serious, just delete the unwanted times and keep the first one. To reduce unwanted shots, choose the photocell height well, generally at chest height for the racers.

## **OPTICAL RANGE**

The maximum recommended separation between the emitter and the receiver is 150 meters (about 500 feet). They can usually be aligned in a few seconds at around 100 meters (about 300 feet). You can attempt distances greater than 150 meters (for example, 200 meters), but it will be more challenging to align them because visually, the photocell becomes very small at a distance, and you will need visual references for alignment.



## WIRELESS RANGE

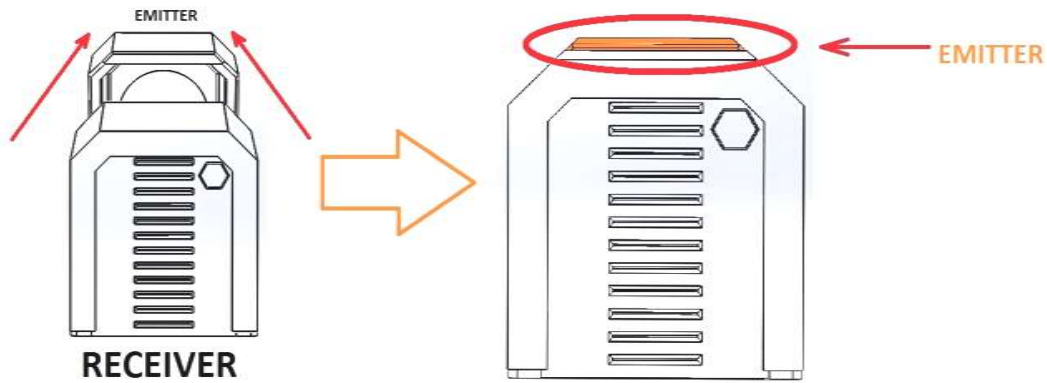


The wireless range is the maximum recommended distance from the receiver to the phone or computer responsible for capturing timings. This distance is 90 meters (about 300 feet) when using a phone or tablet and approximately 50 meters (about 170 feet) when using a computer. The range may be reduced in high-humidity environments, in the presence of obstacles between the receiver and the phone or computer, or if the photocell's height is too close to the ground. Even if your phone or computer performs well at greater distances, we do not recommend using it during a competition, as some shots may be lost.

## ALIGNMENT

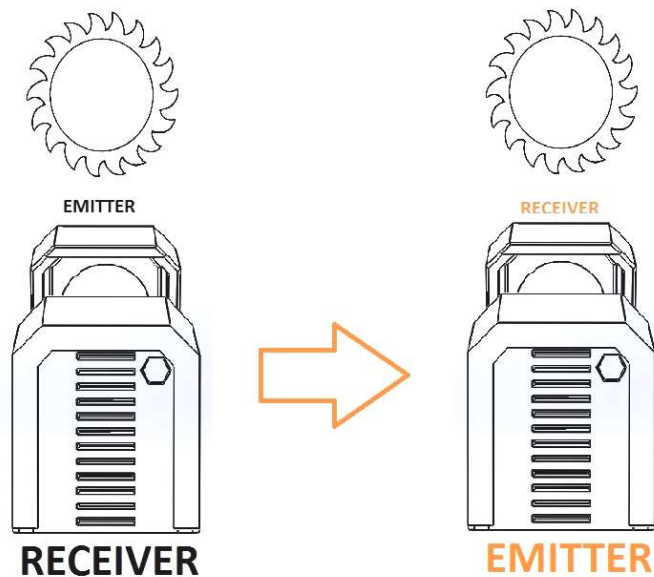
Even if the receiver's BEEP sound is turned off (indicating that the photocells are aligned), it does not necessarily mean they are CORRECTLY aligned. To achieve proper alignment, follow these steps:

1. Interrupt the barrier close to the receiver with a thin stick of approximately 15mm (between 9/16 to 5/8 inches). If the barrier is correctly aligned, the photocell should not trigger, meaning you should not hear any sound. The alignment is now ready; otherwise, proceed to step 2.
2. Adjust the tripod of your emitter parallel to the ground (use the level bubble on your tripod). Then, adjust your receiver to the same height, and using the two axes of your tripod, point the receiver toward the emitter as you would with a rifle. Perform the test from step 1 until the alignment is ready. You will find that the alignment does not have to be perfect to pass this test. The signal strength is such that it allows for a slight misalignment of a few degrees.



#### OTHER HANDY TIPS

1. Visualize the infrared barrier like a stretchy elastic band. The more you pull it, the thinner and weaker it gets, making it easier to cut. If you pass the test in step 1, it means the infrared barrier is strong, and you won't have false shots caused by small objects, dust, rain, or insects. Of course, the closer the photocells, the easier the alignment process.
2. Try to avoid positioning the receiver directly facing the sun, especially when it's low, like during sunset, to steer clear of false shots. If that happens, just swap the positions of the emitter and the receiver.

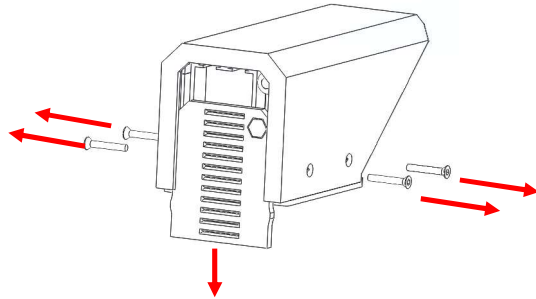


#### MAINTENANCE

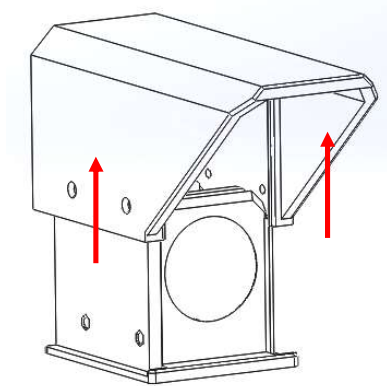
To ensure optimal performance, consider the following recommendations:

1. If you use the photocells infrequently, remove the batteries after use to prevent sulfation of the battery holder terminals. In case of sulfation, clean the terminals with a metal brush or scrape them with a pointed metal object, such as a knife or screwdriver. Then, finish the cleaning with alcohol by rubbing the terminals with a plastic brush or cotton swab.
2. If you use the photocell in heavy rain or in an intense dust cloud, and you notice internal dirt or condensation on the photocell lens, you can remove it for cleaning or

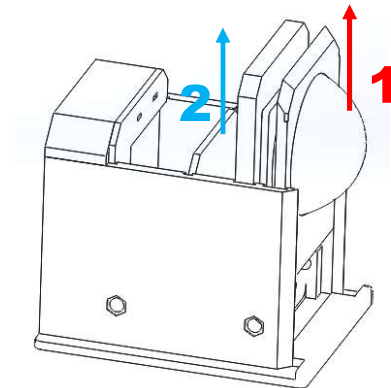
drying to ensure proper functioning. To do this, remove the back cover, the batteries, and the four screws with a 2mm Allen key.



While gently holding the front cover (that secures the lens) and the rear battery holder with your fingers, lift the main cover upward:



For the receiver, slide the lens (1) and the filter (2) upward to remove them. For the emitter, only slide the lens since it does not have a filter:



Clean both windows of the filter and the lens using compressed air or kitchen paper. You can use alcohol, but avoid using other chemicals to prevent irreversible damage to the acrylic. The lens is sandwiched between two covers; you can separate them for easier work. You can take this opportunity to clean or dry with compressed air. Use a specific electronic spray or a compressor with a water trap to avoid adding moisture to the electronics; alternatively, a simple hairdryer (not too hot) can serve the purpose.



Check if the filter shows burns in the form of "melted" areas. This could be caused by prolonged direct exposure to the sun (for example, if the photocell is "looking up" directly at the sun for an extended period). If the damage is severe, contact your distributor to purchase a replacement.

Reassemble following the steps in reverse order. When tightening the four screws, do not use excessive force. First, make sure each screw threads in smoothly by hand. If you feel resistance, unscrew and try again. When the screw stops, you can give it up to a 1/4 turn more, BUT NO MORE. If you use an electric screwdriver, use the minimum torque position.

## CONNECTION TO A PHONE OR TABLET

Enable the Bluetooth option on your Android phone, iPhone, tablet, or iPad, and follow the instructions in the respective guide. It works with Android 7 and above and iOS 8.0 and above. Note that there is a number from 1 to 9 below the receiver. This is the identifier for the photocell. If your receiver doesn't have any identifier, it means the identifier is "1". For instance, if you purchase three barriers, you might receive three receivers with the numbers "1", "2", and "3". The identifier serves to distinguish each barrier as long as your software version supports that mode. For example, if you are timing a race where the start and finish are close enough to use a single phone for both barriers, then the software could recognize which barrier is for the start and which is for the finish. If the software doesn't yet support this mode, then the phone will connect to all receivers that are on and within its range, capturing times from both barriers without knowing which shot comes from where, unless you pay attention to the start and finish.

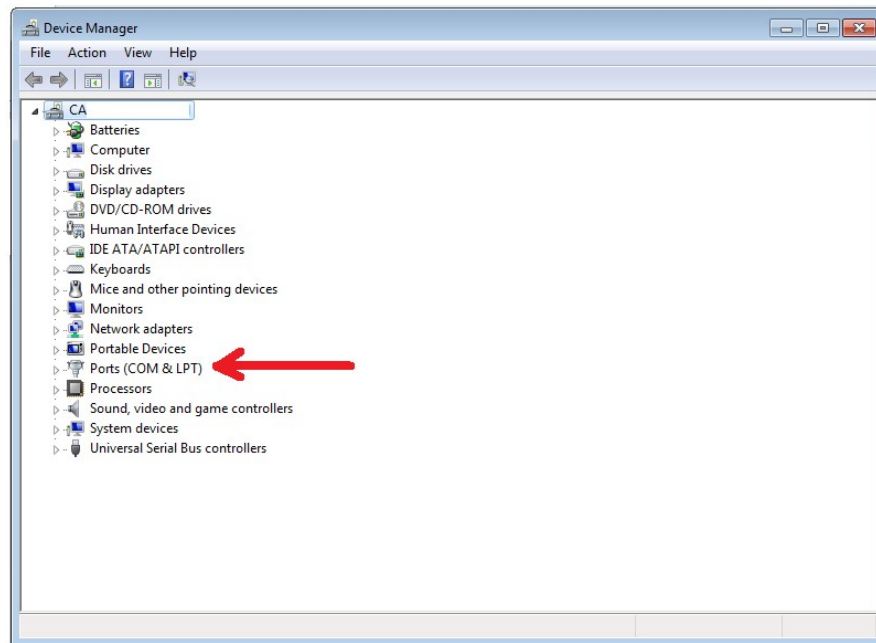
## CONNECTION TO A LAPTOP WITH WINDOWS

You will need our USB interface (sold separately). The identifier number below your receiver should match the identifier under your interface (for example, both on channel 1 or both on channel 2):

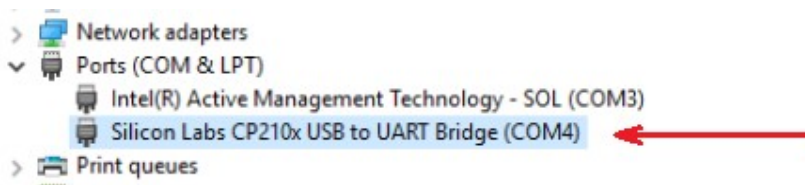


Instructions:

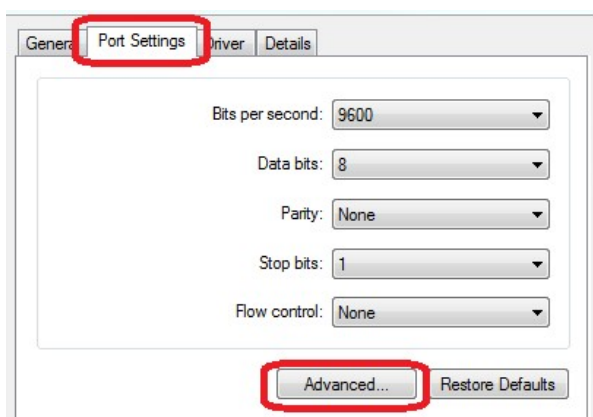
1. Go to the following link: <https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers>
2. Navigate to the "Download" tab and download the latest version of the driver for your operating system.
3. Install the driver (do not plug in the USB interface yet).
4. Then, plug in the USB interface.
5. Open your Device Manager:



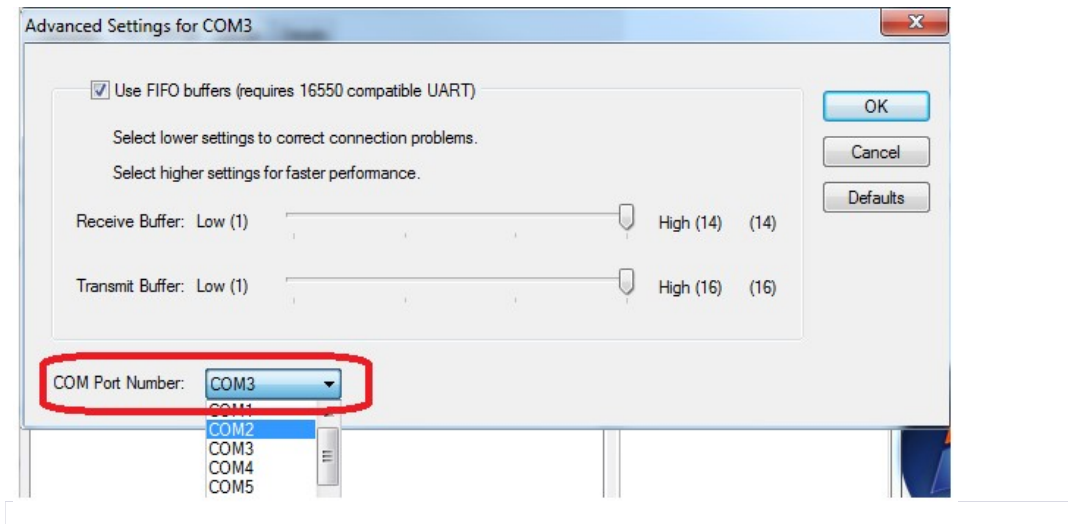
6. Expand the Ports list.



7. In this example, the Port number where the interface is connected is "4," but in your case, it could be any other number. You can change this number to a more memorable one (for example, change it to number 10). To do this, right-click and go to "Port Settings," then "Advanced..."



Now, choose the desired port number.



- Accept everything, unplug the interface, and plug it back in.
8. Now, you'll need to enter that Port number into the timing software and virtually connect the port by clicking the corresponding button (refer to your timing software manual). Try to prevent accidental disconnections. Unlike a USB flash drive, these connections are serial port emulations, which means that in case of accidental disconnections (where the interface may or may not physically disconnect from the USB port), you can not simply re-establish the connection by re-plugging the interface. The first thing to do in that case is to virtually disconnect the port by clicking the disconnect button in your software. Then unplug the interface (if it hadn't physically disconnected, then unplug it and plug it back in). Wait about five seconds and reconnect the port virtually by clicking the corresponding button in your software. Ensure to avoid future accidental disconnections caused by movements or bumps to your computer and interface.